

What is claimed is:

1. A semiconductor module comprising:

a module board having wiring over an upper surface thereof and external electrode terminals over a lower surface thereof;

a first semiconductor chip and a second semiconductor chip formed over the module board and including active elements; and

an integrated passive device,

wherein one semiconductor chip out of the first semiconductor chip and the second semiconductor chip and the integrated passive device are mounted over an upper surface of the module board in an overlapped manner.

2. A semiconductor module according to claim 1, wherein the first semiconductor chip and the second semiconductor chip include an amplifying circuit and an output of the first semiconductor chip is inputted to the second semiconductor chip.

3. A semiconductor module according to claim 2, wherein an inter-stage matching circuit is provided between the first semiconductor chip and the second semiconductor chip and the inter-stage matching circuit is formed of the integrated passive device.

4. A semiconductor module according to claim 3, wherein the semiconductor module includes an input matching circuit which is connected to an input portion of the first semiconductor chip and an output matching circuit which is connected to an output

portion of the second semiconductor chip, and the output matching circuit is formed by the connection of discrete parts.

5. A semiconductor module comprising:

a module board having wiring over an upper surface thereof and external electrode terminals over a lower surface thereof;

a first semiconductor chip and a second semiconductor chip formed over the module board and including active elements; and

an integrated passive device,

wherein the first semiconductor chip is mounted over the second semiconductor chip.

6. A semiconductor module according to claim 5, wherein a heat value of the second semiconductor chip is larger than a heat value of the first semiconductor chip.

7. A semiconductor module according to claim 6, wherein discrete parts are mounted over an upper surface of the module board.

8. A semiconductor module according to claim 6, wherein the integrated passive device is arranged over the first semiconductor chip.

9. A semiconductor module according to claim 6, wherein the integrated passive device is mounted over an upper surface of the first semiconductor chip, and the second semiconductor chip is mounted over the integrated passive device.

10. A semiconductor module according to claim 9, wherein

discrete parts are mounted over an upper surface of the module board.

11. A semiconductor module according to claim 6, wherein the first semiconductor chip and the second semiconductor chip include amplifying circuits, an output of the first semiconductor chip is configured to be inputted to the second semiconductor chip, and an inter-stage matching circuit is provided between the first semiconductor chip and the second semiconductor chip.

12. A semiconductor module according to claim 11, wherein the semiconductor module includes an input matching circuit which is connected to an input portion of the first semiconductor chip and an output matching circuit which is connected to an output portion of the second semiconductor chip, and the output matching circuit is formed by the connection of discrete parts.

13. A semiconductor module comprising:

a module board having wiring over an upper surface thereof and external electrode terminals over a lower surface thereof;

a first semiconductor chip and a second semiconductor chip over which active elements are formed; and

a first integrated passive device,

wherein the first semiconductor chip and the second semiconductor chip are arranged at an upper surface side of the module board with a predetermined distance therebetween.

14. A semiconductor module according to claim 13, wherein the first integrated passive device is arranged over an upper

surface of the first semiconductor chip.

15. A semiconductor module according to claim 14, wherein discrete parts are mounted over an upper surface of the module board.

16. A semiconductor module according to claim 14, wherein a second integrated passive device is mounted over an upper surface of the module board, and semiconductor chips including an active element are not present between the second integrated passive device and the module board.

17. A semiconductor module according to claim 16, wherein discrete parts are mounted over the upper surface of the module board.

18. A semiconductor module according to claim 14, wherein a second integrated passive device is mounted over an upper surface of the module board, and the second integrated passive device is mounted over an upper surface of the second semiconductor chip.

19. A semiconductor module according to claim 13, wherein the first integrated passive device is arranged below the first semiconductor chip.

20. A semiconductor module according to claim 19, wherein the first integrated passive device is mounted over the upper surface of the module board by flip-chip connection.

21. A semiconductor module according to claim 20, wherein discrete parts are mounted over the upper surface of the module

board.

22. A semiconductor module according to claim 19, wherein discrete parts are mounted over an upper surface of the module board.

23. A semiconductor module according to claim 13, wherein the first semiconductor chip and the second semiconductor chip include amplifying circuits, an output of the first semiconductor chip is configured to be inputted to the second semiconductor chip, an inter-stage matching circuit is provided between the first semiconductor chip and the second semiconductor chip, and the inter-stage matching circuit is comprised of the integrated passive device.

24. A semiconductor module according to claim 23, wherein the semiconductor module includes an input matching circuit which is connected to an input portion of the first semiconductor chip and an output matching circuit which is connected to an output portion of the second semiconductor chip, and the output matching circuit is formed by the connection of a plurality of discrete parts.

25. A semiconductor module comprising:

a module board having wiring over an upper surface thereof and external electrode terminals over a lower surface thereof; and

a first semiconductor chip and a second semiconductor chip formed over the module board and including active elements;

wherein the first semiconductor chip and the second semiconductor chip are arranged with a predetermined distance therebetween in the horizontal direction over an upper surface side of the module board,

wherein the first integrated passive device is mounted over the first semiconductor chip,

wherein the first semiconductor chip and the second semiconductor chip include amplifying circuits,

wherein an output of the first semiconductor chip is configured to be inputted to the second semiconductor chip,

wherein an inter-stage matching circuit is provided between the first semiconductor chip and the second conductor chip, and

wherein the inter-stage matching circuit is comprised of the first integrated passive device.

26. A semiconductor module according to claim 25, wherein the semiconductor module includes an input matching circuit which is connected to an input portion of the first semiconductor chip and an output matching circuit which is connected to an output portion of the second semiconductor chip, and the output matching circuit is formed by the connection of discrete parts.

27. A semiconductor module according to claim 26, wherein the first semiconductor chip and the module board are electrically connected to each other by conductive wires and the first integrated passive device and the module board are

electrically connected to each other by conductive wires.

28. A semiconductor module according to claim 26, wherein a second integrated passive device is mounted over an upper surface of the module board, and semiconductor chips including an active element are not present between the second integrated passive device and the module board.

29. A semiconductor module according to claim 28, wherein the second integrated passive device and the module board are electrically connected to each other by conductive wires.

30. A semiconductor module comprising:

a module board having wiring over an upper surface thereof and external electrode terminals over a lower surface thereof; and

a first semiconductor chip and a second semiconductor chip including active elements,

wherein the first semiconductor chip and the second semiconductor chip are arranged with a predetermined distance therebetween in the horizontal direction over an upper surface side of the module board,

wherein the first integrated passive device is arranged below the first semiconductor chip,

wherein the first semiconductor chip and the second semiconductor chip include amplifying circuits,

wherein an output of the first semiconductor chip is configured to be inputted to the second semiconductor chip,

wherein an inter-stage matching circuit is provided between the first semiconductor chip and the second semiconductor chip, and

wherein the inter-stage matching circuit is comprised of the first integrated passive device.

31. A semiconductor module according to claim 30, wherein the semiconductor module includes an input matching circuit which is connected to an input portion of the first semiconductor chip and an output matching circuit which is connected to an output portion of the second semiconductor chip.

32. A semiconductor module according to claim 31, wherein the first integrated passive device is mounted over an upper surface of the module board by the flip-chip connection.

33. A semiconductor module comprising:

a module board having wiring over an upper surface thereof and external electrode terminals over a lower surface thereof; and

semiconductor chips including an active element; and an integrated passive device mounted over an upper surface of the semiconductor chip,

wherein the semiconductor chips include a first amplifying circuit and a second amplifying circuit,

wherein an output of the first amplifying circuit is configured to be inputted to the second amplifying circuit,

wherein an inter-stage matching circuit is provided



between the first amplifying circuit and the second amplifying circuit, and

wherein the inter-stage matching circuit is comprised of the integrated passive device.

34. A semiconductor module according to claim 33, wherein the semiconductor module includes an output matching circuit which is connected to an output portion of the second amplifying circuit, and the output matching circuit is formed by the connection of a plurality of discrete parts.

35. A semiconductor module according to claim 1, wherein the semiconductor module includes a heat radiation pad which is formed over a lower surface of the module board and a plurality of vias which are formed such that the vias vertically penetrate the module board and have lower ends thereof connected to the heat radiation pad, and the second semiconductor chip is arranged over the plurality of vias.

36. A semiconductor module according to claim 35, wherein a recess is formed in an upper surface of the module board, and the vias are formed in a bottom of the recess in a plural number, and the second semiconductor chip is mounted over the bottom of the recess.

37. A semiconductor module according to claim 1, wherein the first semiconductor chip, the second semiconductor chip and the integrated passive device are covered with a sealing portion made of insulating resin.

38. A semiconductor module according to claim 37, wherein end portions of the sealing portion are not positioned outside the end portions of the module board.